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<b>TRANSMITTAL FORM</b> <i>(to be used for all correspondence after initial filing)</i>	<b>Application Number</b>	10/037,195	
	<b>Filing Date</b>	11/09/2001	
	<b>First Named Inventor</b>	BREAULT, R.	
	<b>Group Art Unit</b>	1745	
	<b>Examiner Name</b>	KALAFUT, S.	
<b>Total Number of Pages in This Submission</b>	60	<b>Attorney Docket Number</b>	C-2269A

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THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	)	Group Art Unit: 1745
RICHARD D. BREAUT, et al.	)	Examiner: KALAFUT, S.
Serial No. 10/037,195	)	Filed: 11/09/2001
For: DIRECT ANTIFREEZE COOLED	)	
FUEL CELL	)	Atty. Docket No. C-2269A

**SECOND PRELIMINARY AMENDMENT FOR DIVISIONAL APPLICATION**  
**FILED UNDER 37 C.F.R. § 153(b)**

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Commissioner:

This "Second Preliminary Amendment" includes argument below and a "Declaration Under 37 C.F.R. 1.132" (attached as Exhibit 1) to present factual evidence to respond to a rejection of specific claims in the parent application serial no. 09/359,475 (now U.S. Patent No. 6,316,135 (copy attached for convenience as Exhibit 2)). A "Summary of Prosecution" of the parent application found in the "Preliminary Amendment" filed with the above referenced Divisional Application is repeated in part hereinbelow for convenience.

**I. INTRODUCTION - SUMMARY OF PROSECUTION OF PARENT APPLICATION**

The parent application, serial no. No. 09/359,475 (attached as U.S. Patent No. 6,316,135 (hereafter "the '135 Patent")) claimed in essence a fuel cell having a "direct antifreeze solution" passing through a porous water transport or cooler plate that is secured in "direct fluid communication" with a "wetproofed cathode support

means", which in turn is also "secured in direct fluid communication with the cathode catalyst". (See Claim 1.) The inventors found that a "direct antifreeze solution" could pass through the porous cooler plate without limiting performance of the fuel cell by contacting to an excessive degree the cathode catalyst or anode catalyst. By utilizing a porous cooler plate in fluid contact with the cathode catalyst, product water generated at the catalyst could flow into the cooler plate, so that the cooler plate would not have to be sealed from the reactant streams flowing through the fuel cell. (See Specification, at page 23, lines 15 - 20.)

Three specific types of the direct antifreeze solution were described. An "organic antifreeze solution that does not wet the wetproofed cathode support means and that is non-volatile at cell operating temperatures" is one description of the "direct antifreeze solution". (See application, claim 1 prior to amendment.) An "alkanetriol direct antifreeze solution" is a second description of the "direct antifreeze solution". (See application claim 2.) And, a third description of the "direct antifreeze solution" is a "special direct antifreeze solution having; i. a freezing point of at least  $-20^{\circ}\text{F}$ ; ii. a surface tension greater than 60 dyne/cm at an operating temperature of the fuel cell; iii. a partial pressure of antifreeze above the solution at the cell operating temperature that is less than 0.005 mm Hg; and, iv. a capacity of being oxidized by the anode and cathode catalysts at fuel cell voltages". (See amended Claims 1 and 9 in this divisional application.)

During prosecution of the parent application, the first and third descriptions were canceled, and the Examiner allowed claims including the "alkanetriol direct antifreeze solution". The "properties limitations" of the "special direct antifreeze" were

allowed as claim 8 of the '135 Patent, but only as further limitations of the "alkanetriol direct antifreeze solution".

By this divisional application, the Applicants have accepted the position of the Examiner with respect to the first description of the "direct antifreeze solution" as an "organic antifreeze solution" having the properties described in unamended claim 1 of the parent application. However, Applicants urge that the specific properties of the third description of the direct antifreeze solution identified above and referred to as a "special direct antifreeze solution" are patentable. Therefore, claim 1 has been amended by the first Preliminary Amendment of this Application to include those "special direct antifreeze solution" properties, and claim 9 retains them as in the originally filed parent application.

## II. ARGUMENT

In the October 10, 2000 First Office Action on the parent application, the Examiner rejected the properties of the "special direct antifreeze solution" then found in Claim 9 under 35 U.S.C. § 112 first paragraph as follows:

"because the specification, while being enabling for the recited antifreeze compounds, the class of alkanetriols, does not reasonably provide enablement for any and all organic compounds. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention commensurate in scope with these claims. These claims recite the compounds only according to their properties, which would create a trial-and-error situation when one attempts to practice the invention. The claims also encompass compounds that are never

recited in the specification, but could later be shown by others to exhibit the same properties."

(First Office Action on parent application, Section 2 (emphasis added))

"Enablement Commensurate in Scope With the Claims" is the title of Section 2164.08 of the "Manual of Patent Examining Procedure" ("M.P.E.P.") (Cites to sections and pages of the M.P.E.P. herein will be to the "Original 8<sup>th</sup> Edition, August 2001.) Section 2164.08 also recites:

"The determination of the propriety of a rejection based upon the scope of a claim relative to the scope of the enablement involves two stages of inquiry. The first is to determine how broad the claim is with respect to the disclosure. The entire claim must be considered. The second inquiry is to determine if one skilled in the art is enabled to make and use the entire scope of the claimed invention without undue experimentation."

(M.P.E.P., at § 2164.08 at P. 2100-187)

A. Breadth of Claims Is Supported in the Specification

With respect to the first inquiry, "how broad the claim is with respect to the disclosure", it is pointed out that the specification of the parent and this divisional application include the characterization of the properties of the "special direct antifreeze solution" at page 6, lines 20 - 29, and at page 15, lines 11 - 20. It is pointed out that the characterization of the "special direct antifreeze" properties in those specifications recite that the "surface tension" is "greater than 60 dynes per

centimeter (hereafter 'dyne/cm') at about 150°F," whereas claims 1 and 9 in this divisional application refer to the "surface tension" as being "greater than 60 dyne/cm at an operating temperature of the fuel cell". The specification, however, at page 25, line 33 - page 26, line 3 clarifies that the phrase "fuel cell operating at about 150°F" refers to the described "operating temperature of the fuel cell 10", whereas the "required properties are independent of the operating temperature" of the exemplary "fuel cell 10" described in the specification.

It is also pointed out that the same "special direct antifreeze solution" properties have been allowed as limitations of the "alkanetriol direct antifreeze solution" in claim 8 of the allowed parent application, the '135 Patent. As with this divisional application, the specification of the '135 Patent also recites the "150°F" description of the "fuel cell 10", while claim 8 utilizes the phrase "an operating temperature of the fuel cell". Therefore, it is respectfully submitted that the "properties limitations" of claims 1 and 9 are claimed as broadly as they are disclosed in the specification.

B. Claimed Invention Can be Practiced Without Undue Experimentation

The second inquiry under M.P.E.P. § 2164.08 is "to determine if one skilled in the art is enabled to make and use the entire scope of the claimed invention without undue experimentation". The attached "Declaration Under 37 C.F.R. 1.132" is submitted to establish what would be obvious to one skilled in the art. "Claims are not rejected as broader than the enabling disclosure under 35 U.S.C. 112 for noninclusion of limitations dealing with factors which must be presumed to be within the level of ordinary skill in the art; the claims need not recite such factors where one of

ordinary skill in the art to whom the specification and claims are directed would consider them obvious." (M.P.E.P. § 2164.08, Page 2100-187.)

In his October 10, 2000 First Office rejection of the claims in the parent application having the "properties limitations", the Examiner stated: "These claims recite the compounds only according to their properties, which would create a trial-and-error situation when one attempts to practice the invention. These claims also would encompass compounds that are never recited in the specification, but could later be shown by others to exhibit the same properties." It is respectfully submitted that one attempting to practice the invention claimed in this divisional application would simply have to undertake limited, screening experiments of potential antifreeze solutions to see if they exhibited the properties of claim 1(d) and claim 9(d). If a potential solution exhibited those properties, the person practicing the invention would then only have to arrange the structural elements of the fuel cell claimed in claims 1, sub-paragraphs a, b and c, or the structural elements of the fuel cell claimed in claim 9, sub-paragraphs a, b and c along with the antifreeze solution exhibiting the properties of claims 1(d) and 9(d).

While a person practicing the invention would certainly have to undertake some "trial-and-error" activities or screening experiments, it is submitted that such experiments do not rise to the level of "undue experimentation". That is because "one of ordinary skill in the art to whom the specification and claims are directed" would consider it to be routine experimentation to screen a potential antifreeze solution to determine its freezing point, surface tension, partial pressure, and oxidation characteristics.

The M.P.E.P. describes at Section 2164.01(a) key factors to

consider when determining whether any necessary experimentation rises to the level of "undue experimentation". The listed factors to be considered include:

- (A) The breadth of the claims;
- (B) The nature of the invention;
- (C) The state of the prior art;
- (D) The level of one of ordinary skill;
- (E) The level of predictability in the art;
- (F) The amount of direction provided by the inventor;
- (G) The existence of working examples;
- (H) The quantity of experimentation needed to make or use the invention based on the content of the disclosure.

M.P.E.P. at § 2164.01(a), at page 2100-175.

(A) The "breadth of the claims" has been discussed above wherein it was shown that the scope of the properties limitations of claims 1(d) and 9(d) is found in the specification, and that the same "properties limitations" language is found in claim 8 of the allowed parent, the '135 Patent.

(B) The "nature of the invention" is a fuel cell, however the nature of the "properties limitations" the Examiner has rejected are standard indicia that have been utilized for a long time in describing compounds and solutions. At Section M.P.E.P. Section 2164.05(a), it is stressed that the "specification must be enabling as of the filing date". Identification of the freezing point, surface tension, partial pressure and oxidation characteristics of compounds are indicators that have been utilized long before the filing date of the parent application of July 22, 1999.

(C) The "state of the prior art" is defined in the M.P.E.P. at



Section 2164.01(a) as "what one skilled in the art would have known, at the time the application was filed, about the subject matter to which the claimed invention pertains." As shown in the attached "Declaration Under 37 C.F.R. 1.132", reference treatises are identified therein for both analytical prediction and experimental measurement measuring the freezing point, surface tension, partial pressure and oxidation characteristics of compounds. The dates of the treatises establish that the claimed characteristics could readily have been determined prior to the filing date of the parent application, July 22, 1999.

(D) The "level of one of ordinary skill" in the art is discussed in M.P.E.P. Section 2164.05(b), wherein it is stated: "The relative level of skill of those in the art refers to the skill of those in the art in relation to the subject matter to which the claimed invention pertains at the time the application was filed." The attached "Declaration Under 37 C.F.R. 1.132" presents factual bases for determining the claimed properties of freezing point, surface tension, partial pressure and oxidation characteristics of potential antifreeze solutions by identifying objective resources available to "one of ordinary skill in the art". Each property is associated with several objective resources that teach how to analytically predict or experimentally measure the specific properties recited in claims 1(d) and 9(d).

Additionally, the Declarant further states that he has over thirty-three years of experience in "doing research and development of fuel cells" including being an "inventor or co-inventor of forty fuel cell related patents". (See Declaration, Exhibit 1, at paragraph 2.) Hence it is fair to conclude the Declarant is "one of ordinary skill" in the fuel cell art. The Declarant has not only identified common resources available to those skilled in the art to measure the claims 1(d) and 9(d) properties limitations, but

has also stated at paragraph 7: "I have performed, or had performed for me, such screening experiments on potential antifreeze solutions and other solutions." Hence, the attached evidence within the "Declaration Under 37 C.F.R. 1.132" establishes that measuring the freezing point, surface tension, partial pressure, and oxidation characteristics of a potential antifreeze solution can be accomplished by "one of ordinary skill in the art".

It is appreciated that the Declarant, Richard D. Breault, is also an inventor of the subject matter of this divisional application, and is a consultant of the assignee of all rights in the invention, and hence is an "interested party." However, it is also stressed that the Declarant has provided objective resources that the Examiner, or "one of ordinary skill in the art" may actually obtain, review, and/or use in measuring properties of a potential antifreeze solution. Therefore, the "Declaration Under 37 C.F.R. 1.132" is providing factual evidence for the Examiner, rather than mere "legal conclusions". As stated in the M.P.E.P. at Section 2164.05: "The evidence provided by the applicant need not be conclusive but merely convincing to one skilled in the art." (Emphasis in the original.)

(E) The "level of predictability in the art" is discussed in M.P.E.P. Section 2164.03: "The more that is known in the prior art about the nature of the invention, how to make, and how to use the invention, and the more predictable the art is, the less information needs to be explicitly stated in the specification." (*Id.* at page 2100-177.) Further: "If one skilled in the art can readily anticipate the effect of a change within the subject matter to which the claimed invention pertains, then there is predictability in the art." In this regard, it is stressed that applicants are not claiming a compound by its properties, but instead are claiming a fuel cell having the structural features

disclosed in claim 1 sub-paragraphs a, b, and c, as well as a distinct fuel cell having the structural features disclosed in claim 9 sub-paragraphs a, b, and c, along with the "special direct antifreeze solution" of claims 1(d) and 9(d). Therefore, the question of being able to "anticipate the effect a change" of the claimed properties of the "special direct antifreeze solution" must include the whole claim. Based upon the recitation in the specification of the advantages of not losing the direct antifreeze solution through the "porous water transport [or "cooler"] plate, or through other systems, and of not poisoning the cathode catalysts", it is submitted that one of ordinary skill can "anticipate the effect of a change within the claimed" "special direct antifreeze solution". (See the specification at page 23, line 15 - page 25 line 10.)

It is also pointed out that screening experiments to measure freezing point, surface tension, partial pressure and oxidation characteristics of a potential antifreeze solution should not be categorized in the traditionally "unpredictable" chemical and physiological arts. "In cases involving unpredictable factors, such as most chemical reactions and physiological activity, more may be required." (M.P.E.P. § 2164.04 at page 2100-178.) While the screening experiments may involve chemical compounds or solutions as opposed to more predictable "mechanical" or "electrical" elements, the determination of the freezing point, surface tension, partial pressure, and oxidation characteristics do not involve novel, or unpredictable chemical reactions utilizing novel starting substances or materials. Instead, the measurement of the specific, claimed property limitations is an activity that has been undertaken by those of ordinary skill in the art for many decades. It is urged that the screening experiments described in the attached "Declaration Under 37 C.F.R. 1.132" will produce the same results when performed upon the same

potential direct antifreeze compounds by differing entities that are skilled in the art. Therefore, it is urged that the screening experiments necessary to determine whether-or-not a potential direct antifreeze solution exhibits the properties described in amended claims 1(d) and 9(d) are substantially predictable.

(F) The "amount of direction provided by the inventors" is discussed in M.P.E.P. § 2164.03, wherein it is stated that: "The 'amount of guidance or direction' refers to that information in the application, as originally filed, that teaches exactly how to make or use the invention." It is respectfully urged that consideration of this factor must include the entire claims in issue (independent claims 1 and 9), and not just the "properties limitations" of sub-paragraphs 1(d) or 9(d) in isolation. As recited in paragraph 5 of the attached "Declaration Under 37 C.F.R. 1.132", in order for one to make and use the invention, it is necessary to screen any potential solution to make sure it has the properties limitations of claims 1(d) and 9(d), and then "arrange the structural elements in amended claim 1, [or 9] sub-paragraphs a, b, c into a fuel cell with the selected direct antifreeze having properties of claim 1(d) [or 9(d)]."

The parent application as originally filed includes information that teaches how to make an exemplary fuel cell of the claimed invention starting in the specification of the parent application and this divisional application at page 15, line 5, and going on to page 18, line 5. Components of the claimed fuel cell are described with specificity, including the "PEM electrolyte" (specification, page 15, lines 32 - 35); the porous anode substrate and wetproofed cathode support means (specification, page 16, lines 6 - 15); and, porous cooler plate (specification, page 16, line 32 - page 17, line 5). The exemplary fuel cell described therein utilized "from pure water to 65% glycerol and 35% water"

(specification page 18, lines 18, 19). Use of the exemplary fuel cell is described in detail in the specification from page 18 line 35 to page 22, line 30, which also presents test results of varying several operating parameters. (E.g., see Table 1, page 19, and Table 2, page 20.)

Direction provided by the inventor with respect to the properties of the "special direct antifreeze solution" of claims 1(d) and 9(d) is now augmented by the attached "Declaration Under 37 C.F.R. 1.132". It presents evidence that, at the time of filing of the parent application, one skilled in the art would have been able to ascertain whether-or-not a potential antifreeze solution exhibited the claimed properties through standard screening methods known in the art utilizing objective reference materials available to those skilled in the art. Therefore, it is urged that substantial "direction" has been provided by the inventors within the specification.

(G) The "existence of working examples" is discussed in M.P.E.P. § 2164.02. As described immediately above with respect to the "direction provided by the inventor" in section "(F)", a working example has been described in the specification utilizing one of the three described "direct antifreeze solutions". It is emphasized that one of the three has been deleted, one (the "alkanetriol direct antifreeze solution") has been allowed in the parent application (the '135 patent), and the "special direct antifreeze solution" having the properties of claims 1(d) and 9(d) remains subject to this divisional application. The "working example" utilized the allowed "alkanetriol direct antifreeze solution". It is urged that the description of the working example in the specification therefore has a value with respect to the pending claims of this divisional application that is similar to the value of "Working Examples and a Claimed Genus". (M.P.E.P. §

2164.02 (a heading on page 2100-177))

In other words, the value of applicants' working example in the specification that utilizes the alkanetriol direct antifreeze solution is similar to the value of a working example of a species to a claimed genus (e.g., including the properties limitations), which genus also includes the species of the working example. "For a claimed genus, representative examples together with a statement applicable to the genus as a whole will ordinarily be sufficient if one skilled in the art (in view of the level of skill, state of the art and the information in the specification) would expect the claimed genus could be used in that manner without undue experimentation. Proof of enablement will be required for other members of the claimed genus only where adequate reasons are advanced by the examiner to establish that a person skilled in the art could not use the genus as a whole without undue experimentation." (M.P.E.P. § 2164.02, at page 2100-177)

It is respectfully urged that by the evidence now supplied by the attached "Declaration Under 37 C.F.R. 1.132", it is clear that one skilled in the art would be adequately enabled by the disclosure to make and use the "genus" fuel cells of claims 1 and 9 utilizing a direct antifreeze solution having the properties of claims 1(d) and 9(d), as further supported by the working example in the specification enabled by the "species" of the "alkanetriol direct antifreeze solution".

(H) The final factor, "quantity of experimentation needed to make or use the invention based upon the content of the disclosure", is discussed in M.P.E.P. § 2164.06. Quoting In re Wands, 858 F.2d 731, 737, 8 USPQ2d 1400, 1404, that section states: "The test is not merely quantitative, since a considerable amount of experimentation is permissible, if it is merely routine, or if

the specification in question provides a reasonable amount of guidance with respect to the direction in which the experimentation should proceed.'" Additionally, in the following page 2100-182, same section: "Time and difficulty of experiments are not determinative if they are merely routine." It is respectfully urged that determinations by methods known to one skilled in the art of freezing point, surface tension, partial pressure, and oxidation characteristics of a potential antifreeze solution are "merely routine".

Reviewing the exemplary cases cited within that section of the M.P.E.P. reveals experimentation that contrasts sharply with screening experiments to determine the aforesaid freezing point, surface tension, partial pressure and oxidation characteristics. In United States v. Tectronics, Inc., 857 F2d 77, 8 USPQ2d 1046 (Fed. Cir. 1988) the M.P.E.P. point out that where "one embodiment ... is set forth in the specification, the specification was enabling. The question of time and expense of such studies, approximately \$50,000 and 6 - 12 months standing alone, failed to show undue experimentation." (M.P.E.P. § 2164.06, at page 2100-182). The exemplary cases describing non-enabling disclosures describe: "functional 'block diagrams'" in computer inventions (See reference to In re Ghiron, cited at page 2100-182); failure to indicate whether-or-not "the parts represented by boxes were 'off the shelf' or must be specifically constructed or modified for applicant's system" in an electrical circuit apparatus. (See reference to In re Gunn, cited at page 2100-182); "lack of information in the specification about a single box labeled 'logic' in the drawings." (See reference to In re Donahue, cited at page 2100-182); "because certain computer programming details were not disclosed in the specification...." (See reference to Union Pacific Resources Co. v. Chesapeake Energy Corp., cited at page 2100-182); [A] specification did not particularly identify each of

the elements represented by the blocks or the relationship therebetween...." in a disclosure relating to "facilitating transfers from one subset of program instructions to another which required modification of prior art 'overlap mode' computers." (See second reference to In re Ghiron, cited at page 2100-182); "'how complex elements known to perform broadly recited functions in different systems would be adaptable for use in Appellant's particular system with only a reasonable amount of experimentation'...." in a system "which comprised several component parts (e.g., computer, timing and control mechanism, A/D converter, etc.). (See reference to In re Scarborough, cited at page 2100-183.) Next within that section 2164.06(a) of the M.P.E.P. is "II. Microorganisms", followed by "III Drug Cases", and then section 2164.06(b) "Examples of Enablement Issues - Chemical Cases", all of which involve descriptions of experimentation of a sort substantially distinct from predictable, repeatable, screening experiments to determine freezing temperature, surface tension, partial pressure and oxidation characteristics of a potential antifreeze solution.

Another example of a non-enabling disclosure is provided in M.P.E.P. § 2164.08 (the section on "Enablement Commensurate in Scope With the Claims"). In Amgen v. Chugai Pharmaceutical Co., 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir. 1991), "patent claims were directed to a purified DNA sequence encoding polypeptides which are analogs of erythropoietin (EPO)." In holding that the specification did not enable claims to "all EPO genes", the M.P.E.P. quotes the court: "Details for preparing only a few EPO analog genes are disclosed...." "Despite extensive statements in the specification concerning all the analogs of the EPO gene that can be made, there is little enabling disclosure of particular analogs and how to make them." (Emphasis added.) It is respectfully urged that failure to include in a specification



adequate information to enable one skilled in the art to make gene analogs is thoroughly distinct from enabling one skilled in the art to perform screening tests to determine freezing point, surface tension, partial pressure and oxidation characteristics of a potential antifreeze solution.

No cases cited in these sections of the M.P.E.P. suggest that screening experiments of the type necessary to measure properties of solutions are considered to be "undue experimentation".

Although the cases reviewed above deal with factors in determining whether a claim is enabled by a specification, none of the cases appear to include facts that could directly address the Examiner's specific concern stated in his October 10, 2000 First Office Action that: "These claims recite the compounds only according to their properties, which would create a trial-and-error situation when one attempts to practice the invention. These claims would encompass compounds that are never recited in the specification, but would later be shown by others to exhibit the same properties." Nothing in the reviewed cases or M.P.E.P. sections uncovered by the undersigned states or suggests that a compound or solution cannot be claimed by specific property characteristics if one skilled in the art is able to ascertain such specific properties of a potential compound or solution without "undue experimentation".

One case that does include claims describing "inventive products in terms of ranges of chemical properties" is Union Oil Co. of Calif. v. Atlantic Richfield Co., 208 F.3d 989, 54 USPQ2d 1227, (Fed. Cir. 2000). (Copy of electronic print out of the U.S.P.Q. version attached as Exhibit 3 for convenience.) (It is pointed out that substantively this case deals with a Section 112, first paragraph "written description" issue, and the question of

"enablement" was not before the Court. (See *Id.* Dissent, at 1004, 1238)) Nonetheless, one of the claims presented by the successful patent holder and quoted in the decision includes characterizations of properties substantially similar to subparagraph (d) of claims 1 and 9 of the present divisional application. That claim discloses:

117. [An unleaded gasoline fuel suitable for combustion in an automotive engine, said fuel having a Reid vapor pressure no greater than 7.0 psi, and a 50% D-86 distillation point no greater than 200 degrees F., and a 90% D-86 distillation point no greater than 300 degrees F., and a paraffin content greater than 85 volume percent, and an olefin content less than 4 volume percent] wherein the maximum 10% distillation point is 158 degrees F (70 degrees C.).

(*Id.* at 992, 1228, emphasis added to "properties" phrases.)

The "refiners" defending against assertions of infringement, asserted "that the specification does not describe the exact chemical component of each combination that falls within the range of claims of the '393 patent." The Court responded that "neither the Patent Act nor the case law requires such detailed disclosure." And, the Court further commented: "Drs. Jessup and Croudace described their invention in terms of ranges. That form of description does not offend § 112 [paragraph] 1." (*Id.*, at 997, 1233) Again, it is stressed the Court was deciding a "written description" issue under Section 112, first paragraph, and not an enablement issue. However, it is urged that the quoted claim language presented to the Court of Appeals for the Federal Circuit and competent counsel for the infringing parties ("Atlantic Richfield Company and other appellant refiners") clearly describes

solutions in terms of property ranges as does sub-paragraph (d) of the applicants' claims 1 and 9 of the present divisional application. Yet, there is no indication that the Court or counsel for the infringing parties raised an issue that the claims were invalid because they did not include all possible compounds, or because they may encompass compounds that are not recited in the specification.

Moreover, unlike the quoted claim of patentee Union Oil Co., the properties aspects of applicants' claims 1(d) and 9(d) must be considered with each claim as a whole, including the fuel cell structural elements of sub-paragraphs a, b, and c of claims 1 and 9. Therefore, substantial guidance, and predictability are provided by applicants claims 1 and 9 beyond only the properties limitations of sub-paragraphs (d) of claims 1 and 9.

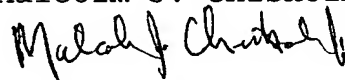
### **III. CONCLUSION**

It is submitted that applicants have demonstrated that independent claims 1 and 9 are supported in the specification of the present divisional application, and that one skilled in the art would have been enabled by the specification at the time it was filed to make and use the invention of claims 1 and 9 without undue experimentation. Accordingly, a Notice of Allowance is respectfully requested.

If the Examiner would like any further information or evidence

to explain or support the above presentation, it is requested that the Examiner contact the undersigned.

Respectfully submitted,  
Malcolm J. Chisholm, Jr.



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Date: 2/19/02

All Other CasesUnion Oil Co. of California v. Atlantic Richfield Co. (CA FC) 54 USPQ2d 1227 (3/29/2000)

Union Oil Co. of California v. Atlantic Richfield Co. (CA FC) 54 USPQ2d 1227

**Union Oil Co. of California v. Atlantic Richfield Co.****U.S. Court of Appeals Federal Circuit  
54 USPQ2d 1227****Decided March 29, 2000  
No. 99-1066****Headnotes****PATENTS****1. Patent construction -- Claims -- Broad or narrow (§ 125.1303)**

Asserted claims for unleaded gasoline claim compositions of matter, and as such cannot embrace only certain uses of that composition without mutating into method claims; however, claims are properly construed to cover only standard automotive gasoline, since claim language specifies fuels for "an automotive engine," not aviation or racing engine, since explicit reference to "unleaded gasoline" invokes standard automotive fuels rather than specialized fuels, and since specification shows that patentees tailored their research to ordinary fuels for use in standard passenger cars.

**2. Patentability/Validity -- Anticipation -- Identity of elements (§ 115.0704).****EXHIBIT 3**

Composition claims that cover only standard unleaded automotive gasoline are not anticipated by aviation and racing fuels within other limitations of claims, since these alleged prior art compositions do not include limitation of being standard automotive fuel, and thus do not contain each and every limitation of claims at issue, and since record does not show that these aviation and racing fuels otherwise have claimed characteristics of particular standard automotive fuels recited in patent.

### **3. Patentability/Validity -- Specification -- Written description (§ 115.1103)**

Patent for automotive gasoline compositions, which claims its inventive products in terms of ranges of chemical properties which work in combination with ranges of other chemical properties to produce gasolines that reduce emissions, is supported by adequate written description, even though specification does not describe exact chemical component of each combination that falls within claimed ranges, since neither Patent Act nor case law requires such detailed disclosure, since specification thoroughly discusses claimed ranges and combinations of multiple properties, and guides skilled artisan in combining these properties, and since skilled refiners testified that specification taught them that inventors possessed emissions-reducing gasolines at time of filing.

#### **Particular patents -- Chemical -- Gasoline**

5,288,393, Jessup and Croudace, gasoline fuel, judgment that patent is not invalid or unenforceable affirmed.

#### **Case History and Disposition:**

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Appeal from the U.S. District Court for the Central District of California, Wardlaw, J.

Action by Union Oil Co. of California against Atlantic Richfield Co., Chevron U.S.A. Inc., Exxon Corp., Mobil Oil Corp., Shell Oil Products Co., and Texaco Refining and Marketing Inc. for patent infringement. Defendants appeal from denial of their motion for judgment holding patent invalid as matter of law based on anticipation and lack of written description, and from holding that patent is not unenforceable for inequitable conduct. Affirmed; Lourie, J., dissenting in part in separate opinion.

#### **Attorneys:**

Michael V. Ciresi, Martin R. Lueck, David W. Beehler, Tracy A. Sykes, and Diane L. Simerson, of Robins, Kaplan, Miller & Ciresi, Minneapolis, Minn., for plaintiff-appellee.

E. Edward Bruce and Christopher N. Sipes, of Covington & Burling, Washington, D.C.; Donald R. Dunner and J. Michael Jakes, of Finnegan, Henderson, Farabow, Garrett & Dunner, Washington; Harry C. Marcus and Bartholomew Verdirame, of Morgan & Finnegan, New York, N.Y., for defendants-appellants.

**Judge:**

Before Mayer, chief judge, and Lourie and Rader, circuit judges.

**Opinion Text**

**Opinion By:**

Rader, J.

The United States District Court for the Central District of California denied the appellants' motion for Judgment as a Matter of Law (JMOL) which sought to overturn the jury verdicts of patent validity and willful infringement. *See Union Oil Co. of Cal. v. Atlantic Richfield Co.*, No. CV-95-2379-KMW, slip op. at 1 (C.D. Cal. Mar. 10, 1998) ( *Unocal I* ). In their JMOL motion, the Atlantic Richfield Company and other appellant refiners asserted that Union Oil Company of California's (Unocal) United States Patent No. 5,288,393 ('393 patent) is invalid under 35 U.S.C. Sections 102 and 112 (1994). The district court also held that Unocal did not commit inequitable conduct before the U.S. Patent and Trademark Office (PTO). *See Union Oil Co. of Cal. v. Atlantic Richfield Co.*, 34 F.Supp.2d 1208, 1222 (C.D. Cal. 1998) ( *Unocal II* ). Because the appellant refiners did not show a reversible flaw in the jury's verdict, this court affirms the district court's denial of JMOL on Sections 102 and 112 issues. Similarly, this court affirms the trial court's discretionary judgment of no inequitable conduct. 1

**I.**

Unocal owns the '393 patent, which claims automotive gasoline compositions that reduce automobile tailpipe emissions. Unocal's original patent application contained 82 claims. As is often the case during the course of prosecution, the inventor added and canceled many claims. Ultimately, 155 claims issued, but Unocal later disclaimed all but the forty-one at issue in this case: claims 20, 53, 54, 56, 57, 71-75, 78, 79, 81, 112-16, 117 (multiply dependent on claims 53, 73, 78, 112, 116, and 125), claim 120 (multiply dependent on claims 55, 78, 79, and 124), claim 121 (dependent on claim 120 and therefore multiply dependent on claims 55, 78, 79 or 124), 125-27, 133-35, 137, 153, and 155. Each claim appears in dependent or multiple dependent form, and has from four to six limitations describing ranges for several of the fuel characteristics. Each claim effectively begins either with the preface " [a]n unleaded gasoline fuel suitable for combustion in an automotive engine" or " [a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine." As an example, Claim 117, as dependent upon claim 116, states: 2

117. [An unleaded gasoline fuel suitable for combustion in an automotive engine, said fuel having a Reid Vapor pressure no greater than 7.0 psi, and a 50% D-86 distillation point no greater than 200 degrees F., and a 90% D-86 distillation point no greater than 300 degrees F., and a paraffin content greater than 85 volume percent, and an olefin content less than 4 volume percent] wherein the maximum 10% distillation point is 158 degrees F (70 degrees C.).

'393 patent, col. 24, ll. 24-27.

As illustrated above, the claims do not describe each gasoline product in terms of molecular structures or lists of ingredients. Instead, the claims specify the chemical properties of the gasolines, reflecting the way oil refiners formulate gasoline. When oil refiners formulate new gasoline products, they do so by mixing petroleum stocks. Different stocks have different properties that are known to oil refiners. The record shows that oil refiners of ordinary skill in the art

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change the chemical properties of gasoline by varying the proportions of different petroleum stocks. Thus the claims which define the invention in terms of various characteristics also inform those of skill in the art of the composition of the claimed gasoline fuels.

Unocal researched extensively the production of automotive gasoline with reduced combustion emissions. Unocal's scientists, Drs. Jessup and Croudace, ultimately filed a patent application based on their findings. Their research taught ways to produce cleaner gasoline by varying the following chemical properties in automotive gasolines: Reid Vapor Pressure (RVP), T10, T50, T90, Olefins, Paraffins, Aromatics, 3 and Octane.

RVP measures the partial pressure of a gasoline sample when heated to 100 degrees F in a sealed container. *See id.* at col. 18, ll. 43-47. T10, T50 and T90 are abbreviations for percentage distillation points, as measured according to an industry standard procedure called "D-86." Each corresponds to the temperatures at which a given percentage of the gasoline sample enters a gaseous phase under specific experimental conditions. Thus, T10 is the 10% D-86 distillation point; T50 the 50% D-86 distillation point; and T90 the 90% D-86 distillation point. The olefins value describes the percentage of the gasoline comprised of olefins measured by volume. Olefins, otherwise known as alkenes, are open-chain hydrocarbons that contain at least one double bond. The paraffins value describes the percentage of the gasoline comprised of paraffins measured by volume. Paraffins, otherwise known as alkanes, are open-chain hydrocarbons that contain only single bonds. The aromatics value describes the percentage of the gasoline comprised of aromatics measured by volume. Aromatics, are compounds whose properties resemble those of 6-carbon ring molecules that have an average of three intra-ring carbon-carbon double bonds (i.e., benzene). Octane, as used in the '393 patent, describes the knocking or detonation characteristics of a gasoline sample as compared with a reference fuel. The octane value is derived by testing gasoline in a special engine under specified experimental conditions, and comparing those results to identically tested reference blends of Isooctane and n-heptane.



Drs. Jessup and Croudace sought to reduce the levels of carbon monoxide (CO), nitrous oxide (NO<sub>x</sub>), and hydrocarbons (HC) emitted from automobile tailpipes. After considerable experimentation, Drs. Jessup and Croudace discovered relationships between the various petroleum characteristics described above and tailpipe emissions. Drs. Jessup and Croudace then patented their innovative fuel compositions, describing the new compositions by their characteristics.

The specification of the '393 patent describes relationships among automotive gasoline characteristics and fuel emissions, including the following:

1. Decreasing RVP is of primary importance, and decreasing T10 and olefin content are of secondary importance for reducing NO<sub>x</sub> emissions. *See* '393 patent, col. 2, ll. 21-29. 2. Decreasing T50 is of primary importance for reducing CO and HC emissions. *See id.* at ll. 7-11. 3. Increasing paraffin content and decreasing T50 are most effective for reducing CO emissions. *See id.* at col. 6, ll. 12-28. 4. Decreasing both olefin content and RVP are most effective for reducing NO<sub>x</sub> emissions. *See id.* at ll. 28-31. 5. HC emissions are most practically reduced by decreasing olefins and/or T50. *See id.* at ll. 46-50. 6. Any combination of the eight characteristics can be increased or decreased as described, and that the greater any individual characteristic is changed in the directions indicated, the better the result. *See id.* at col. 15, ll. 20-28.

The specification also provides specific numerical ranges for each characteristic. For example, the specification teaches:

1. CO and HC emissions can be minimized by reducing T50 below 215 degrees F, preferably below 195 degrees F. *See id.* at col. 2, ll. 7-20. 2. NO<sub>x</sub> emissions can be minimized by (a) decreasing RVP to 8.0 psi or less (preferably below 7.0 psi); (b) decreasing olefins below 15% (preferably to essentially zero); or (c) decreasing T10 below 140 degrees F. *See id.* at ll. 21-34. 3. The best NO<sub>x</sub> reductions are obtained when the olefins are below 15%, RVP is 7.5 psi or less, and T10 is below 140 degrees F. *See id.* at ll. 44-50. 4. All three pollutants are reduced when T50 is 215 degrees F or less and RVP is 8.0 psi or less, with greater reductions when olefins are below 10% or T10 is below 140 degrees F, and still greater reductions when both olefins and T10 are reduced. *See id.* at ll. 54-64.

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5. Further pollution reductions are possible when T50 is below 195 degrees F, olefins are below 5% (preferably at essentially zero), T10 is below 120 degrees F, and/or when RVP is below 7.0 psi. *See id.* at l. 64 - col. 3, l. 3.

Elsewhere the specification describes the optimal ranges for five of the eight fuel characteristics in similar terms.

The specification also states that the gasolines are preferably unleaded, have an octane rating of at least 90, and fall most preferably within one or more of five volatility classes in American Society for Testing and Materials (ASTM) publication D4814-89 (included in Table 1 of the patent). *See id.* at col. 4, l. 66 - col. 5, l. 13. Beyond the optimal ranges for individual characteristics, the '393 patent also discloses preferred fuel mixtures. In sum, the '393 disclosure describes with detail the benefits and methods of varying gasoline characteristics. The specification describes 1) the relationships among the eight individual fuel characteristics and CO, NO<sub>x</sub>, and HC emissions, 2) characteristics most important for emissions, and 3) specific desirable ranges for RVP, T10, T50, olefins, paraffins, and aromatics.

The appellant refiners originally sued Unocal in district court, seeking a declaratory judgment to invalidate the '393 patent. Unocal counterclaimed, alleging willful infringement of the '393 patent. The district court then construed the claims of the '393 patent, effectively converting the refiners' declaratory judgment action into an infringement defense. Then the district court tried those invalidity issues to a jury. During forty-nine days of trial, the jury heard the testimony of numerous witnesses and considered hundreds of exhibits and demonstrations. *See Unocal I*, slip op. at 6. At the close of all evidence, the district court properly instructed the jury on the law, and presented the jury with a special verdict form. The verdict form required the jury to decide validity under Section 102 and Section 112 separately for each of the forty-one asserted claims. With respect to the Section 112 questions, the trial court asked the jury to consider the '393 patent's specification, including the original claims of the application, as filed. *See Northern Telecom, Inc. v. Datapoint Corp.*, 908 F.2d 931, 938, 15 USPQ2d 1321, 1326 (Fed. Cir. 1990) ("The original claims as filed are part of the patent specification."). In total, the trial court's special verdict form asked the jury 223 individual questions. After thirteen days of deliberation, the jury returned and answered affirmatively that sufficient written description supported each of the forty-one asserted claims, and that none was anticipated under Section 102.

The appellant refiners then moved the district court to overturn the jury's verdict with a motion for JMOL based on anticipation, obviousness, and lack of written description. After reviewing arguments of both parties and the record, the district court found that "substantial evidence exists in the record regarding the written description to support the verdict that Drs. Jessup and Croudace had possession of the claimed subject matter." *Unocal I*, slip op. at 6. The district court similarly considered and rejected appellant refiners' arguments on anticipation and obviousness. *See id.* at 3-5.

The appellant refiners also argued that the '393 patent was unenforceable for inequitable conduct. The district court tried that issue itself and held that the refiners did not meet their burden of showing inequitable conduct by clear and convincing evidence. *See Unocal II*, 34 F.Supp.2d at 1222. The district court found the case exceptional, and therefore also awarded attorney fees to Unocal under 35 U.S.C. Section 285 (1994).

The appellant refiners now appeal the district court's denial of JMOL on anticipation and written description. They also appeal the district court's inequitable conduct decision.

## II.

This court reviews the district court's JMOL ruling after a jury verdict by reapplying the district court's own standard. *See Applied Med. Resources Corp. v. United States Surgical Corp.*, 147 F.3d 1374, 1376, 47 USPQ2d 1289, 1290 (Fed. Cir. 1998). Thus, to prevail on appeal, the appellant refiners must show that substantial evidence does not support the jury's factual findings or that the district court erred in applying the law. *See id.*

A district court may overturn a jury's verdict on a motion for JMOL only if, upon the record before the jury, reasonable persons could not reach the verdict returned by that jury. *See Perkin-Elmer Corp. v. Computervision Corp.*, 732 F.2d 888, 893, 221 USPQ 669, 673 (Fed. Cir. 1984). This court must consider the evidence of record in the light most favorable to Unocal, drawing all reasonable inferences in its favor, without disturbing the jury's credibility determinations or substituting this court's resolutions of conflicting evidence for those of the jury. *See Applied Med.*, 147 F.3d at 1376-77.

#### A.

This court requires that a party seeking to invalidate a patent under Section 102 show that the

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allegedly invalidating prior art contains "each and every element of [the] claimed invention." *Lewmar Marine, Inc. v. Barient, Inc.*, 827 F.2d 744, 747, 3 USPQ2d 1766, 1767 (Fed. Cir. 1987). To prevail on anticipation at trial, the refiners had to prove their case by clear and convincing evidence. *See Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1052-53 (Fed. Cir. 1987). The law imposes this high burden because Unocal's patent, like any issued patent, enjoys a presumption of validity. *See id.*

This court reviews a finding of anticipation as a question of fact. *See In re Graves*, 69 F.3d 1147, 1151, 36 USPQ2d 1697, 1700 (Fed. Cir. 1995). Therefore, on appeal, this court must affirm the district court's denial of JMOL on anticipation if substantial evidence supports the jury's verdict that the cited prior art did not anticipate the claims.

"The first step in any invalidity . . . analysis is claim construction." *See Rockwell Int'l Corp. v. United States*, 147 F.3d 1358, 1362, 47 USPQ2d 1027, 1029 (Fed. Cir. 1998). Claim construction is a question of law, which this court reviews without deference. *See Georgia-Pacific Corp. v. United States Gypsum Co.*, 195 F.3d 1322, 1330, 52 USPQ2d 1590, 1597 (Fed. Cir. 1999). "In claim construction the words of the claims are construed independent of the accused product, in light of the specification, the prosecution history, and the prior art. . . . [T]he construction of claims is simply a way of elaborating the normally terse claim language [ ] in order to understand and explain, but not to change, the scope of the claims." *Scripps Clinic v. Genentech, Inc.*, 927 F.2d 1565, 1580, 18 USPQ2d 1001, 1013 (Fed. Cir. 1991) (internal quotation marks omitted).

[1] The claims of the '393 patent recite either " [a]n unleaded gasoline suitable for combustion in an automotive engine" or " [a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine." Thus, the '393 patent claims compositions of matter. The scope of these composition claims cannot, as the appellant refiners argue, embrace only certain uses of that composition. *See In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990). Otherwise these composition claims would mutate into method claims. The district court correctly applied this principle, refusing to narrow the scope of the claimed compositions to specific uses.

The district court read each claim in light of the specification, and concluded that the claims cover "fuels that will *regularly* be used in autos, not that conceivably could be." *Union Oil Co. of Cal. v. Atlantic Richfield Co.*, No. CV-95-2379-KMW, slip op. at 7 (C.D. Cal. May 19, 1997) ( *Unocal III* ). The district court thus construed the claims to cover only a narrow class of fuel compositions, namely only standard automotive gasoline. The district court correctly excluded from claim scope a broader class of petroleum formulations such as aviation fuels or racing fuels. The claim language confirms the district court's reading of the claims to cover mass market automotive gasoline. The claim language specifies fuels for an "automotive engine," not an aviation engine. *See, e.g.*, '393 patent, col. 18, l. 65. Moreover the explicit reference to "unleaded gasoline" again invokes standard automotive fuels, rather than specialized fuels. *See, e.g.*, *id.* at col. 18, l. 64.

The district court's interpretation also finds extensive support in the specification. The patentees described the problem that their invention addressed:

One of the major environmental problems confronting the United States and other countries is atmospheric pollution (i.e., "smog") caused by the emission of gaseous pollutants in the exhaust gases from automobiles. This problem is especially acute in major metropolitan areas, such as Los Angeles, Calif., where the atmospheric conditions and the great number of automobiles account for aggravated air pollution.

*Id.* at col. 1, ll. 9-16. Similarly, the patentees describe their testing procedures and results in the specification. Specifically, the patentees used ordinary passenger automobiles in their tests. The '393 patent records the results of testing certain fuels in a 1989 Oldsmobile Calais, a 1988 Oldsmobile 98, a 1985 Ford Tempo, a 1990 Lincoln, a 1984 Chevrolet Caprice, a 1988 Honda Accord, a 1989 Ford Taurus, a 1990 Plymouth Shadow, a 1985 Chevrolet Suburban, and a 1990 Toyota Camry. *See id.* at fig. 9. None of these are aviation or racing vehicles.

Similarly, another passage provides context for the trial court's claim construction. The patentees describe their choice of test vehicles as follows:

A total of 22 different unleaded gasoline fuels was tested in a 1988 Oldsmobile Regency 98 automobile equipped with a 3800 cc V-6 engine. This automobile was selected because it represented a high sales volume product with close to the current state-of-the-art emission technology.

*Id.* at col. 7, ll. 61-6. The patentees tailored their research and their patent to ordinary fuels for use in standard passenger cars. Thus, the claim language, further informed

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by the specification, shows that the district court correctly read the claims to cover ordinary automotive fuel.

[2] Because the '393 patent covers only standard automotive fuel, the district court correctly determined that specialty fuels within other limitations of the claims do not anticipate under 35 U.S.C. Section 102. In other words, the aviation and racing fuels that allegedly invalidate the '393 claims do not anticipate because they do not contain each and every limitation of the claims. *See Verdegaa*, 814 F.2d at 631. Specifically, this alleged prior art does not include the limitation of being a standard automotive fuel composition.

Moreover, the record does not show that the aviation and racing fuels otherwise have the claimed characteristics of the particular standard automotive fuels recited in the '393 patent. While the record shows that some properties of the aviation and racing fuels coincide with the properties of the '393 patent's claims, the record does not show the presence of each and every limitation. An expert for the refiner appellants stated that the allegedly anticipatory Phillips B-35 racing fuel "is very different from typical [automotive fuel]." Tr. at 4782. When asked, "Is Unocal unleaded racing gasoline very different from typical motor gasoline?", the expert again answered "Yes." *Id.* at 5047. This expert similarly answered "yes" when questioned about whether the asserted aviation fuels were "very different" from typical motor gasoline. *See id.* at 5060.

The district court did not err in construing the claims of the '393 patent. Furthermore the record does not show each and every element of the asserted claims of the '393 patent present in any single prior art reference. Therefore, this court affirms the district court's denial of JMOL on anticipation.

## B.

The first paragraph of Section 112 states that: "The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same." 35 U.S.C. Section 112. In written description cases, "[t]he primary consideration is *factual* and depends on the nature of the invention and the amount of knowledge imparted to those skilled in the art by the disclosure." *In re Wertheim*, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976) (emphasis added). This court reviews a jury's factual findings for substantial evidence. *See B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1423, 43 USPQ2d 1896, 1899 (Fed. Cir. 1997).

The written description requirement does not require the applicant "to describe exactly the subject matter claimed, [instead] the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed. Cir. 1989) (citations omitted). Thus, Section 112, Para. 1 ensures that, as of the filing date, the inventor conveyed with reasonable clarity to those of skill in the art that he was in possession of the subject matter of the claims. *See Vas-Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563-64, 19 USPQ2d 1111, 1117 (Fed. Cir. 1991).

In the course of the lengthy jury trial, the district court heeded this court's counsel to use special verdicts in complex cases. *See Comark Communications, Inc. v. Harris Corp.*, 156 F.3d 1182, 1189 n.1, 48 USPQ2d 1001, 1006 n.1 (Fed. Cir. 1998). The district court presented the jury with a verdict form asking it to decide separately whether each of the claims met the written description requirement. Following these instructions, the jury returned its verdict answering affirmatively forty-one separate times that sufficient written description supported each of the asserted claims.

After the jury's verdict, the appellant refiners renewed their motion for JMOL to overturn the jury's verdict. *See* Fed. R. Civ. P. 50(b). The district judge then reconsidered the patent documents independently in light of all the evidence and denied the JMOL motion, thus upholding the jury's verdicts. Like the district court, this court must accord deference to the jury findings on written description. This court will not substitute its judgment for that of the fact finder. *See General Electro Music Corp. v. Samick Music Corp.*, 19 F.3d 1405, 1412, 30 USPQ2d 1149, 1155 (Fed. Cir. 1994).

[3] On the record in this appeal, substantial evidence amply supports the jury's findings and the trial judge's JMOL ruling. The '393 patent teaches the effects of varying the properties of automotive gasolines to reduce harmful tailpipe emissions. In the art of gasoline production, skilled refiners obtain raw petroleum products and mix them together to achieve a desired product. Each product is the mixture of many chemicals in varying proportions. The '393 patent teaches that changes in the proportions of different hydrocarbon-containing streams mixed to

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produce gasoline with specific properties reduces the amount of NO<sub>x</sub>, CO, and hydrocarbons emitted from an automobile engine. Varying one or more properties in turn affects other properties of a gasoline product. Therefore, the patent claims its inventive products in terms of ranges of chemical properties, which work in combination with ranges of other chemical properties to produce a gasoline that reduces emissions.'

Appellant refiners assert that the specification does not describe the exact chemical component of each combination that falls within the range claims of the '393 patent. However, neither the Patent Act nor the case law of this court requires such detailed disclosure. *See In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1533, 25 USPQ2d 1241, 1245 (" [The applicant] does not have to describe exactly the subject matter claimed."); *Vas-Cath*, 935 F.2d at 1566 ("ranges found in applicant's claims need not correspond exactly to those disclosed in [the specification]; issue is whether one skilled in the art could derive the claimed ranges from the [ ] disclosure."). Rather, the Patent Act and this court's case law require only sufficient description to show one of skill in the refining art that the inventor possessed the claimed invention at the time of filing.

Drs. Jessup and Croudace described their invention in terms of ranges. That form of description does not offend Section 112, Para. 1. In fact, this invention lends itself to description in terms of ranges and variance of those ranges to achieve particular properties of the gasoline products. The inquiry for adequate written description simply does not depend on a particular claim format, but rather on whether the patent's description would show those of ordinary skill in the petroleum refining art that the inventors possessed the claimed invention at the time of filing.

In this case, the patent teaches one of ordinary skill that reducing T50 progressively reduces CO and hydrocarbons; reducing olefins progressively reduces NOx and hydrocarbons; increasing paraffins progressively reduces CO and NOx; and so forth with several other relationships. Then the patent claims ranges for these properties that provide cleaner gasoline emissions. The Background and Abstract portions of the specification discuss thoroughly the claimed ranges and the combinations of multiple properties.

For example, the written description supporting a single claim - claim 117 -- follows:

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(Emphasis added.)

The specification further guides the skilled artisan in combining the above properties: "It will also follow that one can increase or decrease any combination of the eight properties listed above, i.e., at least two, at least three, at least four, etc., of the properties can be increased or decreased in the direction indicated above, as well as all eight." '393 patent, col. 15, ll. 20-25. The record of the trial contains testimony and exhibits showing in similar terms the written description and support for each of the forty-one claims.

To reiterate, this court supplies the written description supporting another claim, claim 125, as follows:

<i>Claim limitation</i>	<i>Support in '393 patent</i>
T50 at $\leq 205^{\circ}$	Col. 2, ll. 17-18: "Preferred fuels have a 50% D-86 Distillation Point of <i>205<sup>o</sup> F. (96.1<sup>o</sup> C) or less.</i> "
RVP at $\leq 7.0$ psi	Col. 14, ll. 36-40: "Reid Vapor Pressure specification of 8.0 psi ... <i>even more preferably no greater than 7.0 psi ...</i> "
Olefin at $< 6.0$ volume percent	Col. 14, ll. 23-30: "varying the olefin content, this value is generally maintained less than 15 volume percent, with decreasing values providing progressively improved results. Thus, it is contemplated that each unit reduction, e.g., to values <i>below ... 6 ... providing progressively better results. ...</i> "
Paraffin at $> 75$ volume percent	Col. 14, ll. 49-59: "progressively increasing the paraffin content progressively decreases the CO emitted. Accordingly ... the paraffin content would be increased to ... [and] <i>even more preferably above 75 volume percent. ...</i> "

(Emphasis added.)

Beyond this evidence from the patent itself, skilled refiners testified that the specification taught them that the inventor possessed the emission-reducing gasolines at the time of filing. For example, when questioned, Richard Stellman, an expert in the field, stated:

Q: Does the patent teach one of ordinary skill in the art such as yourself to alter two or more of the properties in a particular - in the prescribed fashion in order to affect all three of the criteria pollutants?

A: Yes, it does. Q: And does the patent set forth values from which one of ordinary skill in the art can practice the invention? A: Yes, it does.

Tr. at 2515.

The patent unmistakably informs skilled refiners to increase or decrease the various components to arrive at preferred combinations. In fact, the written description usually labels both preferred and most preferred levels within each range. Skilled refiners testified that they knew the composition of the claimed combinations based on this written description. Contrary to appellant refiners' arguments to this court, the record shows that refiners of ordinary skill understood and applied the '393 patent's teachings. In sum, the record shows that the inventors possessed the claimed invention at the time of filing in the assessment of those of ordinary skill in the petroleum refining art. 5 Moreover, the jury in this case reached the same conclusion as a matter of fact - a proposition that this court cannot disturb on this record which supplies substantial evidence to support that finding.



The appellant refiners attempt to rescue their written description argument by focusing on the T90 levels cited in claims 74, 81, 116, 117, and 127. Appellant refiners allege that the "specification provides no specific T90 values . . . [and that a]lthough five of the original application claims recited combinations including a T90 limitation, they bear no resemblance to the remaining claims with T90 limitations." Appellants' Br. at 46. Appellant refiners misapprehend the teachings of T90 levels. The '393 patent teaches that lowering the T90 distillation point below prior art standards for automotive gasolines creates the desired effect. See '393 patent, col. 2, l. 1. The standards set forth in Table 1 of the '393 patent describe the ASTM standards for gasolines that have T90 distillation points between 365 and 374 degrees F. The T90 distillation points in the originally filed claims were less than or equal to either 315 or 300 degrees F, thus substantially lower than in the prior art gasolines. The claimed ranges of the originally filed claims are the same as those set forth in the six claims of the issued '393 patent that contain T90 limitations. In other words, the disclosure at the time of filing taught one of skill in the art that the inventors possessed the subject matter of the later claims. Even if appellant refiners' argument were correct, that analysis only addresses the validity of five claims, leaving the remaining thirty-six claims.

Appellant refiners argue that *In re Ruschig*, 379 F.2d 990, 154 USPQ 118 (CCPA 1967), supports their argument. This court's predecessor discussed in *Ruschig* whether a claim for a particular pharmaceutical compound copied into a patent application for the purposes of provoking an interference was adequately supported by the written description of a class of compounds. *Ruschig* is different than this case for several reasons. First, the *Ruschig* case involved a copied claim (another inventor's claim copied into Ruschig's application), which did not find support in Ruschig's application because Ruschig had invented and disclosed a broad set of the compounds that was similar, but not entirely within the scope of the claim. Because another inventor, not Ruschig, drafted the claim at issue to fit another specification, it is not surprising that the disputed claim did not find support in Ruschig's specification, even though the inventions were similar. In this case however, the claims, although amended in the course of prosecution, were drawn to the inventions of Jessup and Croudace, who drafted the

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claims with support from their own specification.

Second, as this court's predecessor explained in distinguishing *Ruschig* in another case involving ranges:

If lack of literal support alone were enough to support a rejection under Section 112, then the statement of *In re Lukach* . . . that "the invention claimed does not have to be described *in ipsius verbis* in order to satisfy the description requirement of Section 112," is empty verbiage.

*Wertheim*, 541 F.2d at 265. As in this case, in *Wertheim* the asserted claims covered a range ("solids level of at least 35%"), *id.* at 258, whereas the specification disclosed a broader range ("concentrated . . . until a concentration of 25 to 60% solid matter is reached"), *id.* at 262 (internal quotation marks omitted). In *Wertheim* the CCPA held that the specification supported the claimed range, even though the precise range of the claim was not repeated verbatim in the specification, as the dissent in this case would appear to require. In so holding, the court cautioned that it would "let form triumph over substance" if it allowed the written description requirement to eviscerate claims that are narrowed during prosecution, simply because the patent applicant broadly disclosed in the original patent application but then narrowed his claims during prosecution. See *id.* at 263. Additionally, *Wertheim* reiterates the often cited rule that written description questions are intensely factual, and should be dealt with on a case-by-case basis, without the application of wooden rules. See *id.* at 262. Thus, *Wertheim* fully supports the result in this case and limits the applicability of *Ruschig*.

Our predecessor court in *Ruschig* expressed concern over the extent to which the patentee relied on variables in describing structures, leading that court to explain that rather than blaze marks on trees, the patentee had simply provided the public with a forest of trees. Artisans skilled in petroleum refining, in contrast, are aware of the properties of raw petroleum sources and know how to mix streams of such sources to achieve a final product with desired characteristics. Thus the patentee in this case taught the desired characteristics of the final automotive fuels, realizing that those of skill in this art know that those characteristics define the claimed products.

A closer case for assessing the facts of written description in these forty-one verdicts -- one which dealt with ranges and combinations -- is *Ralston Purina Co. v. Far-Mar-Co, Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985). In *Ralston*, a case in which this court applied the less deferential clear error standard appropriate for this court's review of bench verdicts, this court noted that the ranges in applicant's claims need not correspond exactly to those disclosed in the parent application. See *id.* at 1575. Rather, this court clarified that the issue is whether one of skill in the art could derive the claimed ranges from the parent's disclosure. See *id.*; see also *Vas-Cath*, 935 F.2d at 1566 (holding that the district court erred in "applying a legal standard that essentially required the drawings of the '081 design application to necessarily exclude all diameters other than those within the claimed range."). Because of the fact-sensitive nature of the written description inquiry, this court has often warned against misapplication of precedents in this area. See *Vas - Cath*, 935 F.2d at 1562 (citing *In re Driscoll*, 562 F.2d 1245, 1250, 195 USPQ 434, 438 (CCPA 1977)). This case illustrates the reason for that warning. *Ralston* governs this case.

The written description requirement does not require identical descriptions of claimed compounds, but it requires enough disclosure in the patent to show one of skill in this art that the inventor "invented what is claimed." *Vas-Cath*, 935 F.2d at 1563. On this precise question the jury received many days of testimony, heard from skilled refiners, reviewed graphs and claim charts, and examined the patent documents as guided by those skilled in the art. Indeed the district court, which also heard all the evidence from those of skill in the art, stated: "[T]he Court finds that substantial evidence exists in the record regarding written description to support the verdict that Drs. Jessup and Croudace had possession of the claimed subject matter." *Unocal I*, slip op. at 6. This court agrees. Because the record shows substantial evidence of adequate written description for each claim as the jury found, this court affirms.

### III.

Applicants for U.S. patents and their representatives before the PTO are subject to a duty of candor, good faith and honesty in their prosecution of patent applications. See 37 C.F.R. Section 1.56 (1999). "A breach of this duty constitutes inequitable conduct." *Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1178, 33 USPQ2d 1823, 1826 (Fed. Cir. 1995). If a court determines that a patentee has engaged in inequitable conduct, the court must consider whether, as a matter of

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equity, the patent should be deemed unenforceable. See *LaBounty Mfg., Inc. v. ITC*, 958 F.2d 1066, 1070, 22 USPQ2d 1025, 1028 (Fed. Cir. 1992). Because as the name suggests, inequitable conduct is an equitable issue, this court reviews such determinations for an abuse of discretion. See *Kingsdown Med. Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 876, 9 USPQ2d 1384, 1392 (Fed. Cir. 1988) ( *en banc* in relevant part). Moreover this court will not disturb the district court's factual determinations of materiality and intent without a "definite and firm conviction that a mistake has been committed." *Id.*

In this case, the district court issued a thorough and well reasoned opinion that shows consideration of the fundamental issues of inequitable conduct. Specifically, the district court noted that the allegedly withheld test data would not have been material to the patentability of the claims. See *Molins*, 48 F.3d at 1179. The district court also found no intent to deceive by withholding the disputed test records, but instead determined that Unocal acted in good faith during the prosecution. This court detects no clear error in these findings and no abuse of discretion in the district court's determination of no inequitable conduct.

### IV.

Because the record contains substantial evidence to support the jury's verdicts of no anticipation and sufficient written description, this court affirms the district court's denial of JMOL. Similarly, this court affirms the district court's inequitable conduct determination.

### COSTS

Each party shall bear its own costs.

### AFFIRMED

### Footnotes

Footnote 1. Because the appellant refiners did not question the district court's willfulness determination in their appeal, this court does not address that issue.

Footnote 2. Because the claims are written in multiple dependent form, the claim elements that are incorporated from other claims have been paraphrased in brackets.

Footnote 3. Although the '393 patent teaches increasing the aromatic content of automotive gasoline to reduce tailpipe emissions, the claims do not mention aromatic content.

Footnote 4. One of this court's predecessor courts clarified that disclosure in an originally filed claim satisfies the written description requirement. See *In re Gardner*, 480 F.2d 879, 880, 178 USPQ 149 (CCPA 1973) ("Under these circumstances, we consider the original claim in itself adequate 'written description' of the claimed invention. It was equally a 'written description' . . . whether located among the original claims or in the descriptive part of the specification.").

Footnote 5. The dissent contends that the specification does not show that the inventors possessed the amended claims at the time of filing. In its arguments, the dissent discounts the skill in this art, which, the jury found, knows the composition of gasolines from the specification's description of characteristics. Further, the dissent discounts the jury's role in finding, as a matter of fact, that the inventor satisfied the written description requirement, preferring instead its own "findings" about the knowledge of skilled artisans and about the sufficiency of the disclosures.

#### Concurring/Dissenting Opinion Text

##### Concurrence/Dissent By:

Lourie, J., dissenting in part.

Because the jury's verdict that the claims are not invalid for lack of written description is not supported by substantial evidence, I would reverse the district court's denial of the motion for JMOL, hold the relevant claims to be invalid, and vacate the damages and attorney fees awarded to Unocal. Because the district court did not abuse its discretion in concluding that Unocal did not engage in inequitable conduct, I would affirm that decision. I would not reach the anticipation issue.

Unocal's '393 patent is directed to specific gasoline compositions, albeit compositions defined by ranges of properties. No matter how an invention is claimed, it must be described in the specification. The claimed compositions were not so described. The majority supports its affirmance of the denial of the JMOL using enablement reasoning. It points to the numerous references in the specification to teachings of the various ways one may obtain particular combinations of properties for the fuels. These are *general* descriptions of how to make fuel compositions, not descriptions of the *claimed* compositions. They may also constitute descriptions of *processes* for obtaining various *characteristics* of fuel compositions, but it is specific *compositions* that are claimed here, not processes. There are written descriptions of other particular compositions in the specification, but they are not written descriptions of the inventions claimed here. It is in fact undisputed that the specification discloses no distinct embodiments corresponding to any claim at issue.

The majority supports its decision in part with two charts purporting to show detailed support in the specification for claims 117 and 125. However, the description that the majority provides, with commendable thoroughness, shows the weakness of its conclusion. The claimed compositions do not appear in the specification as such. The charts were synthesized by pulling together various directions in the specification in order to constitute the claimed compositions. Note the references to different parts of the specification for the various components. The patent does not contain such complete descriptions of those compositions; they were presumably prepared after the grant of the patent for purposes of litigation by Unocal. Erroneously, they were accepted by the jury, the trial judge, and the appellate majority.

Unocal's original application contained 82 claims. During the course of prosecution, 161 claims were added and 47 canceled. Ultimately, 196 claims issued, but Unocal later disclaimed all but the 41 at issue in this case. None of these claims were in the original application; all were added by amendment.

The written description requirement ensures that, at the time a patent application is filed, the inventor has possession of the invention claimed. *See Vas-Cath v. Mahurkar*, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed. Cir. 1991). It also serves the obvious purpose of telling the public what it is that has been invented. Possession of the

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invention at the time of filing is best shown by a precise description in the text of the patent specification of all of the aspects of the claimed invention. It is well-established that each claim in a patent constitutes a separate invention, *see, e.g., Jones v. Hardy*, 727 F.2d 1524, 1528, 220 USPQ 1021, 1024 (Fed. Cir. 1984); thus, a written description of the invention of each claim as such must be provided if the statutory requirement is to be met as to that claim.

It is true that a patent need not describe the claimed subject matter in precisely the same terms as used in the claims, *see Vas-Cath*, 935 F.2d at 1563-64, 19 USPQ2d at 1116; however, it must still describe the invention with all its claimed limitations in some manner, *see Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997); *In re Wertheim*, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1979). "Precisely how close the original description must come to comply with Section 112 must be left to case-by-case development." *Vas-Cath*, 935 F.2d at 1561, 19 USPQ2d at 1116 (citing *In re Smith*, 458 F.2d 1389, 1395, 173 USPQ 679, 683 (CCPA 1972)).

It is clear beyond peradventure that there is no written description of any of the claimed compositions as such. There surely is a description of most of the particular *claim limitations* of the various claims, but that is not the same as a description of a *specific composition* described by a particular selection of those characteristics. If the written description does not use precisely the same terms used in a claim, the question then is whether the specification directs or guides one skilled in the art to the subject matter claimed. See, e.g., *Fujikawa v. Wattanasin*, 93 F.3d 1559, 1570, 39 USPQ2d 1895, 1904 (Fed. Cir. 1996). One of our predecessor courts analogized the requirement that the written description direct one to the claimed subject matter to "blaze marks" on specific trees that mark a trail through a forest. See *In re Ruschig*, 379 F.2d 990, 994-95, 154 USPQ 118, 122 (CCPA 1967). It found that a broad generic disclosure failed to constitute a description of a specific claimed compound. We have subsequently stated that without such specific direction, a general disclosure will not be sufficient to support narrowly claimed subject matter. See *Fujikawa*, 93 F.3d at 1571, 39 USPQ2d at 1905 ("In the absence of [ ] blazemarks [that the claimed compounds were of special interest], simply describing a large genus of compounds is not sufficient to satisfy the written description requirement as to particular species or subgenuses."). That direction must be expressed in "full, clear, concise, and exact" language. See *Fields v. Conover*, 443 F.2d 1386, 1391, 170 USPQ 276, 280 (CCPA 1971); *In re Ahlbrecht*, 435 F.2d 908, 911, 168 USPQ 293, 296 (CCPA 1971); *Ruschig*, 379 F.2d at 996, 154 USPQ at 123.

Each of the claims at issue here recites a fuel having a specific combination of different fuel characteristics. Although the specification separately describes most of the individual characteristics of the combinations, it is undisputed that none of the claims at issue is matched in the specification by the combination of characteristics required by that claim. A reasonable juror could not find that the application shows possession of those combinations of characteristics by blazing a clear trail to them.

Unocal points to descriptions of individual fuel characteristics at column 14 of the specification, as well as to the prosecution history. However, column 14 simply outlines the range of variation of T10 and T50, olefin content, and RVP in order to obtain emission reductions. This is an enablement disclosure, not a description of particularly claimed compositions. Describing these individual fuel characteristics in broad terms is not the same as describing an invention reciting specific combinations of fuel characteristics. The question is not whether each of the claim limitations finds support in the specification but whether the inventions claimed, fuels having *specific combinations of characteristics*, finds such support. The simple direction to adjust more than one fuel characteristic at a time does not direct one to, and thus does not show possession of, any of the claimed combinations of fuel characteristics. One must pick and choose among eight different types of fuel characteristics, broadly described, in order to arrive at any of the claimed combinations.

For example, as indicated earlier, to arrive at one of the combinations described in claim 117, Unocal had to pick through the specification to find the claimed limitations. Four of the limitations--the T50, RVP, olefin, and paraffin limitations--fell within ranges *broadly described*, but there is no direction to a composition having all of these limitations in the *particular ranges claimed*. Furthermore, no specific T90 ranges are described anywhere in the specification except in Table 1, which recites only certain general ASTM standards. Unocal had to point to an original, canceled claim to support the T90 value chosen, but that characteristic was part of a composition no longer claimed and no longer part of the specification. Lastly, the specification repeatedly describes fuels

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with a T10 less than 140 degrees F, but the claim recites a fuel with a maximum T10 of 158 degrees F. The specification's only recitation of a fuel with a T10 of 158 degrees F is one of the ASTM standards in Table 1, not a part of a described embodiment of the invention. By picking and choosing, one can thus find all of the limitations, but the specification gives no direction, let alone the "full, clear, concise, and exact" direction required, to the claimed combination. The same picking and choosing is required to arrive at all of the claims asserted. When one has to pick and choose among a wide range of variables to construct a claim, the subject matter of that claim has not been described as required by the statute; possession has not been demonstrated.

Unocal makes numerous references to what the specification teaches. It does so by referring to general descriptions of the possible variables. The specification does in fact contain a written description of methods for lowering auto emissions. It also teaches how to make various *types* of compositions and methods, but does not contain a written description of the *specifically claimed* compositions. It is well settled that the enablement requirement is separate and distinct from the written description requirement of Section 112, Para. 1, *see Vas-Cath*, 935 F.2d at 1563, 19 USPQ2d at 1117, and that a specification may enable one skilled in the art to make and use an invention and yet still not describe it, *see id.* at 1562, 19 USPQ2d at 1115. Whether the specification fulfills the enablement requirement by teaching how to make the claimed combinations is not before us; the fact remains that it does not describe any one of the claimed compositions. In fact, the extensive recitation of differing ranges and preferences for particular characteristics is in stark contrast to the lack of any specific description of a composition, particularly a composition set forth in the current claims.

Unocal's reference to the broad ranges of the characteristics of the various gasolines also may be an adequate written description of a generic group of gasolines defined broadly by those characteristics. However, such a generic claim is not before us. We only have claims defining compositions by a specific set of claim limitations, none of which compositions finds a specific description in the patent specification. In *Ruschig*, the Court of Customs and Patent Appeals held that a general formula containing variables that each include a number of possible groups does not describe each composition within its scope. The court stated that "[s]pecific claims to single compounds require reasonably specific supporting disclosure . . . ." *Ruschig*, 379 F.2d at 994, 154 USPQ at 122. The same applies to the specific compositions here. The court in *Ruschig* found certain alleged "guides" in the specification inadequate, stating that "we are looking for blaze marks which single out particular trees. We see none." *Id.* at 995, 154 USPQ at 122. The court distinguished the written description requirement from enablement, which it considered might have been satisfied by the specification. *See id.* *Ruschig* is directly pertinent to the present case, and the fact that Unocal's patent claims multiple species of compositions in no way lessens the force of *Ruschig* as relevant precedent here. Each of the claims in the '393 patent suffers from the same defect.

Attempting to distinguish *Ruschig*, the majority asserts that this is a *Ralston Purina* case, but the *Ralston Purina* opinion itself states that written description cases must be decided on a case-by-case basis. *See Ralston Purina Co. v. Far-Mar-Co, Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed. Cir. 1985). In finding satisfaction of that requirement, it distinguishes a number of cases in which the requirement was not met "due to a number of different factors." *See id.* The case-by-case analysis advocated in *Ralston Purina* leads in this case to the reality that the requirement has not been satisfied.

I recognize that this is a jury trial and that the written description requirement is a question of fact concerning which we owe considerable deference. However, jury verdicts are not irreversible if substantial evidence is lacking. Substantial evidence is that minimum quantum of evidence from which a reasonable jury might afford relief. *See Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 249-50 (1986) (holding that "merely colorable" or "not significantly probative" evidence is insufficient to meet the substantial evidence standard); *Consolidated Edison Co. v. NLRB*, 305 U.S. 197, 229 (1938) ("Substantial evidence is more than a mere scintilla. It means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion."). If a reasonable jury could not have found the facts necessary to support a verdict, the trial judge or reviewing court should reverse.

This is a highly complicated case, involving a patent that is difficult to fathom. One needs to analyze these claims the way one plans a trip, with a road map, in detail, on paper. Multiple claim dependencies and multiple claim limitations make the task difficult. The complexity of the case is further increased by the way in which the patent application was prosecuted, with wholesale cancellation and addition of claims seemingly irrespective of whether their subject

matter was properly disclosed. It is easy to see how one could go astray.



A reasonable juror is one who has done his or her homework, as described above, in order to determine what each claim covers, and where in the specification there is support for such claims. The result here speaks for itself. When such analysis is performed here, it is plain that the claimed compositions are not described in the patent. No reasonable jury, carefully reading and examining the patent specification, could conclude otherwise, *i.e.*, that the patent specification's descriptions of individual fuel characteristics or the teachings that multiple fuel characteristics can be varied in particular ways constitutes a sufficient written description of the compositions of any of the claims. I therefore respectfully dissent from the conclusion of the majority that the claims have not been shown to be invalid.

- End of Case -

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